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11 Improved communication using avatars

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13 This invention relates to the general fields of capturing  
14 attribute data of individuals and selecting individuals  
15 using captured data, and more specifically to the use of  
16 avatars for capturing attribute data and selecting  
17 individuals. Aspects of the invention relate to  
18 messaging systems and methods utilising avatars to  
19 facilitate rich but anonymous interaction.

20

21 In the field of messaging, text is commonly used to  
22 identify users of messaging systems in ways that describe  
23 their physical, geographical or social attributes. This  
24 allows others to select users for the receipt of  
25 messages. Such text offers descriptive information but  
26 maintains anonymity and privacy. A series of static  
27 graphical icons can also convey this information.

28 However, the problem with this approach is that it does  
29 not present users with a simple, instant visual  
30 description that assists in making a go /no-go decision  
31 on whether or not to pursue contact.

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1 If a user wants to show other users what they look like,  
2 they can post a photograph. However, a high percentage  
3 of Internet dating site users do not and will not post  
4 photographs of themselves for reasons of personal  
5 privacy; they would inevitably lose some anonymity.

6

7 Posting some other static image depicting some of their  
8 physical attributes is an option, for example using a  
9 drawing program or scan of a hand drawing. However, this  
10 is often not convenient for the user and it does not  
11 facilitate automated searching for or organising of the  
12 attributes, other than by some complex pattern-  
13 recognition software trawling through the images.

14

15 The user is therefore constrained in that they can either  
16 keep anonymity but not convey their appearance  
17 adequately, or lose anonymity by showing what they look  
18 like with a photograph. Furthermore, a problem with  
19 static images, including photographs, is that they are  
20 not easy to update with real time information about the  
21 user.

22

23 At present, Microsoft®'s instant messaging service  
24 depicts its Buddy List as a set of monochrome pawns with  
25 names below. This pawn representation does provide  
26 anonymity if accompanied by a user name that is  
27 pseudonymous, and thus would hide the identity of the  
28 associated user. However, the viewer still has to rely  
29 on the text to identify users, due to the uniformity of  
30 the pawn representations.

31

32 Items on the Buddy List also provide status information,  
33 for example indicating that another user is on-line, but

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1 fail to convey more detailed information about the user.  
2 For example, characteristics such as the users  
3 appearance, location, or present activity are not  
4 conveyed. Worse still, the rendering of the Buddies on  
5 the list is performed without reference to the current  
6 status of the attributes of the user being represented.  
7 Even if the text is descriptive of such attributes, it is  
8 rendered using information that was entered at the time  
9 of registration of the users' account.

10

11 It is an object of the present invention to provide  
12 convenient capture of individual's attributes.

13

14 It is a further object of the present invention to  
15 provide convenient selection of an individual from their  
16 attributes.

17

18 It is a further object of the present invention to  
19 provide convenient use of individual's attributes for  
20 messaging.

21

22 According to a first aspect of the invention, there is  
23 provided a method of messaging comprising the steps of:

- 24 - maintaining a database of records, each record  
25 comprising attributes of an individual and an  
26 identifier of said individual;
- 27 - receiving at least one input attribute from a  
28 user;
- 29 - retrieving at least one record from the database  
30 in accordance with at least one input attribute;
- 31 - identifying an individual corresponding to each  
32 selected record;

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- 1        - rendering at least one avatar using attributes
- 2                comprised in the at least one selected record;
- 3        - selecting a rendered avatar;
- 4        - sending a message to the identified individual.

5

6 According to a second aspect of the invention, there is  
7 provided a method of messaging comprising the steps of:

- 8        - maintaining a database of records, each record
- 9                comprising attributes of an individual and an
- 10          identifier of said individual;
- 11        - receiving at least one input attribute from a
- 12          user;
- 13        - rendering an avatar responsive to the input
- 14          attributes;
- 15        - retrieving at least one record from the database
- 16          in accordance with at least one input attribute;
- 17        - identifying an individual corresponding to each
- 18          retrieved record;
- 19        - sending a message to the identified individual.

20

21 The method may comprise the additional step of rendering  
22 at least one avatar using attributes comprised in the  
23 selected records.

24

25 The method may comprise the additional step of selecting  
26 at least one of the rendered avatars.

27

28 Preferably, the step of selecting at least one of the  
29 rendered avatars is in response to a selection input by  
30 the user.

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1 The method may comprise the additional step of receiving  
2 the message from the user.

3

4 The method may comprise the additional step of verifying  
5 that a status of a user is such that the user is not  
6 blocked from sending a message to an identified  
7 individual.

8

9 The method may comprise the additional step of  
10 determining whether a user has been assigned a status of  
11 disallowed sender to an identified individual, and  
12 preventing the rendering of an avatar corresponding to  
13 that identified individual.

14

15 Preferably, the step of determining a status of the user  
16 is dependent on the identity of the user and the identity  
17 of the individual.

18

19 The status of the individual may be determined using the  
20 database.

21

22 The method may comprise the steps of storing an  
23 identifier associated with a selected record, and  
24 determining the status of the individual using the  
25 associated identifier.

26

27 The method may comprise attributes relating to a location  
28 of an individual.

29

30 According to a third aspect of the invention, there is  
31 provided a system for messaging comprising:

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- 1        - a storage means for storing a plurality of
- 2              records, each record comprising attributes of an
- 3              individual and an identifier of said individual;
- 4        - an avatar rendering and selection means for
- 5              rendering an avatar using attributes stored in the
- 6              storage means, and selecting a rendered avatar;
- 7              and
- 8        - a messaging means, for identifying an individual
- 9              corresponding to the selected rendered avatar, and
- 10             sending a message to the identified individual.

11

12 The system may comprise a display for displaying a  
13 rendered avatar to the user.

14

15 Preferably, the avatar rendering and selection means is  
16 adapted to receive attributes input by a user for  
17 matching and retrieving data in the storage means and  
18 render an avatar responsive to said input attributes.

19

20 Preferably, the avatar rendering and selection means is  
21 adapted to match input attributes with records in the  
22 database and retrieve matched records.

23

24 Optionally, the input attributes relate to the location  
25 of an individual.

26

27 Optionally, the input attributes include details of an  
28 individual's physical appearance.

29

30 The details of the individual's physical appearance may  
31 be selected from a list of head shapes, eye colours,  
32 eyelid states, mouth types, hairstyles, hair colours,  
33 skin colours, breast size, belly size and clothing.

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2 The clothing may be selected from a list comprising: top  
3 style, top colour, bottom style, bottom colour, shoe type  
4 and shoe colour.

5

6 The attributes of an individual may include details of  
7 the individual's behaviour.

8

9 The details of the individual's behaviour may be selected  
10 from a list comprising: smoking preference, drink  
11 preference, musical preference, and interests.

12

13 The avatar rendering and selection means may be further  
14 adapted to verify that a status of a user is such that  
15 the user is not blocked from sending a message to an  
16 identified individual.

17

18 The avatar rendering and selection means may be further  
19 adapted to determine whether a user has been assigned a  
20 status of disallowed sender to an identified individual,  
21 and prevent the rendering of an avatar corresponding to  
22 that identified individual.

23

24 The avatar rendering and selection means may be further  
25 adapted to determine the status of the individual using  
26 the database.

27

28 The avatar rendering and selection means may be adapted  
29 to store an identifier associated with a selected record,  
30 and the status of the individual may be determined using  
31 the associated identifier.

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1 Preferably, the inputting of attributes is performed  
2 using a graphical user interface that includes an output  
3 rendered avatar.

4

5 According to a fourth aspect of the invention, there is  
6 provided a method of capturing attributes of individuals  
7 comprising the steps of:

- 8 - maintaining a database of records, each record  
9 comprising attributes of an individual and an  
10 identifier of an individual;  
11 - receiving at least one input attribute from a  
12 user;  
13 - rendering an avatar, responsive to said input  
14 attributes.

15

16 According to a fifth aspect of the invention, there is  
17 provided a system for capturing attributes of individuals  
18 comprising:

- 19 - a storage means for storing a plurality of  
20 records, each record comprising attributes of an  
21 individual and an identifier of said individual;  
22 - a character engine means for receiving input  
23 attributes of an individual and rendering an  
24 avatar, responsive to said input attributes.

25

26 According to a sixth aspect of the invention, there is  
27 provided a method of selecting individuals comprising the  
28 steps of:

- 29 - maintaining a database of records, each record  
30 comprising attributes of an individual and an  
31 identifier of said individual;

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- 1        - receiving at least one input attribute from a
- 2              user;
- 3        - retrieving at least one record from the database
- 4              in accordance with at least one input attribute;
- 5        - rendering at least one avatar using attributes
- 6              comprised in the at least one selected record;
- 7        - selecting a rendered avatar.

8

9 According to a seventh aspect of the invention, there is  
10 provided a system of selecting individuals comprising:

- 11        - a storage means for storing a plurality of
- 12              records, each record comprising attributes of an
- 13              individual and an identifier of said individual;
- 14        - an avatar rendering and selection means for
- 15              rendering an avatar using attributes stored in the
- 16              storage means, and selecting a rendered avatar.

17

18 In order to provide a better understanding of the present  
19 invention, various embodiments will now be described, by  
20 way of example only, and with reference to the  
21 accompanying Figures in which:

22

23        Figure 1 illustrates a flow chart of the steps of a  
24              method of capturing attributes including rendering  
25              an avatar, in accordance with an embodiment of the  
26              invention;

27

28        Figure 2 illustrates a flow chart of the steps of a  
29              messaging method including the steps of selecting  
30              individuals using selection of avatars, in  
31              accordance with an embodiment of the present  
32              invention;

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2       Figure 3 illustrates a graphical user interface for  
3       building an avatar and a selection of avatars  
4       rendered to display a range of attributes in  
5       accordance with an embodiment of the invention; and

6

7       Figure 4 illustrates the components of a system in  
8       accordance with an embodiment of the present  
9       invention;

10

11      Figure 5 illustrates a web services model used with  
12     an embodiment of the invention.

13

14     The invention is a method and system that functions to  
15     capture attributes of individuals through a convenient  
16     interface for both the maintenance of a database and  
17     selection of records in the database for messaging  
18     purposes.

19

20    With reference to Figure 1, a flowchart 10 of an example  
21    method of capturing and using attributes of individuals  
22    is shown.

23

24    During registration, the system determines 12 the  
25    identifier of the individual, e.g. an email address,  
26    name, or pseudonym, and stores 14 the identifier in the  
27    database 16. The database 16 is maintained to contain  
28    attributes and identifiers of individuals.

29

30    The user inputs 18 attributes of an individual using a  
31    "character engine" graphical user interface that includes  
32    a displayed avatar. During registration, the attributes  
33    are personal attributes relating to the user itself,

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1 although they could also relate to another individual.  
2 The displayed avatar is rendered 20 responsive to the  
3 input attributes. The input attributes are stored 22 in  
4 the database 16 along with the identifier. The data  
5 including the attributes and the identifier can be termed  
6 a record.

7

8 This process allows users to describe themselves by  
9 building the avatar. In this embodiment, instead of  
10 using a series of drop down menus or text inputs, users  
11 build up the image of an avatar by graphically choosing  
12 hairstyle, hair colour, face shape, etc.

13

14 With reference to Figure 3, upon registration, a  
15 graphical user interface 310 displays a naked avatar 311  
16 with a menu 312 for selecting attributes 313. Attribute  
17 selection button 314 can be clicked on by the user to  
18 change the selected attribute, which also triggers the  
19 avatar-rendering module to re-render and output the  
20 avatar with the selected attribute depicted. A save  
21 button 315 can be clicked by the user to trigger the  
22 character engine to store the attribute in the database.  
23 Based on the physical appearance users now build up their  
24 avatar.

25 .

26 A selection of such avatar heads 316 is shown. Further  
27 physical appearance is differentiated by selecting the  
28 colour of clothing and preferred type of drink. Male  
29 figures 317 can be described down to belly size  
30 reflecting physical build. Female avatars 318 can be  
31 enhanced with chest size, makeup, clothing colour and  
32 preferred drink. Facial expressions 319 can be created  
33 by the use of eyelids.

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2 Attributes of an individual include details of the  
3 individual's physical appearance such as their head  
4 shape, eye colour, eyelid state, mouth type, hairstyle,  
5 hair colour, skin colour, breast size, belly size and  
6 their clothing.

7

8 Their clothing is selected from top style, top colour,  
9 bottom trousers, bottom colour, shoe type, and shoe  
10 colour.

11

12 The attributes may include details of the individual's  
13 behaviour such as smoking preference, drink preference,  
14 musical preference, interests and clothing preferences.

15 Attributes may also include details of an individual's  
16 favourite community such as a sporting or musical  
17 community.

18

19 The attributes are stored in the database, starting with  
20 a "naked" avatar defined by the following data:

21

22 char\_head\_shape=oval  
23 char\_eye\_col=blue  
24 char\_eye\_lid=open  
25 char\_mouth=mouth6  
26 char\_hair\_style=s15  
27 char\_hair\_col=ginger  
28 char\_fag=no  
29 char\_specs=none  
30 char\_facial=none  
31 char\_makeup=lash  
32 char\_sex=female  
33 char\_col=black

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```
1  char_chest=medium
2  char_belly=none
3  char_top=tshirt
4  char_top_col=white
5  char_bot=skirt1
6  char_bot_col=blue
7  char_shoe=shoes
8  char_shoe_col=white
9  char_drink=cock
10
11 This data represents a blank avatar that is displayed at
12 the start of the registration process, or when a user
13 visits the site and is not logged in. Note that although
14 some of the values are actually set at this point, they
15 need not be rendered on the avatar. For example
16 'char_hair_col = ginger' does not appear as ginger hair
17 on the character because 'char_hair_style=s15' is given,
18 which corresponds to the avatar having no hair.
19
20 After inputting or changing the attributes, the final
21 attributes are stored in the database, for example:
22
23 char_head_shape=round
24 char_eye_col=brown
25 char_eye_lid=open
26 char_mouth=mouth1
27 char_hair_style=s13
28 char_hair_col=black
29 char_fag=no
30 char_specs=none
31 char_facial=none
32 char_makeup=lash
33 char_sex=female
```

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14

1 char\_col=white  
2 char\_chest=none  
3 char\_belly=none  
4 char\_top=sweat  
5 char\_top\_col=yellow  
6 char\_bot=bare  
7 char\_bot\_col=blue  
8 char\_shoe=bare  
9 char\_shoe\_col=blue  
10 char\_drink=none  
11

12 The user has thus created a personal avatar, and is able  
13 to download either the rendered avatar or the attributes  
14 themselves to their computer or mobile telephone for a  
15 variety of purposes. These purposes include personalised  
16 screen savers, telephone screen logos, email signatures  
17 or instant messaging personalities.

18  
19 The "character engine" graphical user can be presented  
20 via web pages, I-mode, WAP, GPRS, MMS or SMS technologies  
21 and protocols using conventional programming techniques.  
22 In this embodiment, a Macromedia® Flash front end is used  
23 with an asp.net connection module to the database and a  
24 Microsoft® SQL Server database engine.

25  
26 In certain embodiments, the avatar may be animated (e.g.  
27 rendered using an animated GIF) or may perform a number  
28 of automated tasks such as speech or making sound. The  
29 avatar or database may co-operate with software agents  
30 that perform other automated tasks. The avatars may be  
31 3D representations, to which a user may associate a  
32 variety of animated routines and movements.

33

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1 The avatars or stored attributes can be migrated to  
2 personalise web pages or for use in computer games. In  
3 addition, they may be used in the automated production of  
4 merchandise such as stationery (e.g. business cards),  
5 clothing, mouse mats, toys or other goods using the  
6 attributes to select various components of the toys or  
7 other goods. The stored identifier can be used for  
8 addressing delivery of the produced merchandise, etc.

9

10 At a later time, users may update 23, add to or amend  
11 their associated attributes, resulting in the rendering  
12 of an updated avatar and storing of an updated record.  
13 Any associated software modules, such as e-mail programs  
14 can remotely access the latest avatar to provide an  
15 updated graphical e-mail signature.

16

17 Users may also create avatars representative of friends  
18 or contacts, which can be used in directories, contact  
19 lists or as caller ids.

20

21 An aspect of the invention relates to a messaging method,  
22 including a method of selecting individuals, and is shown  
23 in Figure 2 of the drawings, generally depicted at 20.

24

25 Messaging between users is performed by the maintenance  
26 of a database 16 of attributes and identifiers of  
27 individuals, as described above. In the preferred  
28 embodiment, the records in the database are entered in  
29 the manner described with reference to Figures 1 and 3.

30

31 A user inputs 24 attributes relating to an individual  
32 with which he may wish to communicate. These input  
33 attributes are used to render 26 an avatar, which is

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16

1 representative of an individual with which the user may  
2 wish to communicate. The attributes are entered by means  
3 of a "character engine" graphical user interface as  
4 described above with reference to Figures 1 and 3. The  
5 input attributes may be desired physical or social  
6 characteristics, or may relate to a geographical location  
7 of an individual to be communicated with, or a  
8 combination of all three.

9

10 The input attributes used for selecting records from the  
11 database may be attributes relating to the location of  
12 the user himself. For example, if the user inputs his  
13 geographical location, such as the name of a social venue  
14 or bar, via his mobile phone, the system subsequently  
15 selects and retrieves records 28 from the database that  
16 match only that location.

17

18 Subsequently, records from the database providing a match  
19 with the input attributes are selected and retrieved 28  
20 from the database, and avatars are rendered 30 according  
21 to the stored attributes. The rendered avatars are  
22 displayed 36 on the user's display.

23

24 There may be one avatar rendered, or many, depending on  
25 the manner in which the records are selected from the  
26 database 16 by a matching and retrieval process. The  
27 selection process involves a trawl through the database  
28 records, and those records having the most attributes  
29 matching the input attributes are selected and avatars  
30 are rendered. Typically, the eight best-matched avatars  
31 are rendered, in order of suitability.

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1 The embodiment of Figure 2 includes an optional status  
2 checking step 32. An individual with a record stored on  
3 the database is able to assign a status to other users,  
4 from a set of possible statuses. These possible statuses  
5 include recipient, disallowed sender, and allowed sender.  
6 "Recipient" status is for users previously communicated  
7 with, or users with which the individual would wish to  
8 communicate. "Disallowed sender" is a status assigned to  
9 users from which the individual does not wish to receive  
10 messages. "Allowed sender" is the default status for  
11 users that may send messages to an individual. The  
12 statuses are user-specific, in that a status is assigned  
13 to a particular user (an assignee) by a particular  
14 individual (the assignor), and does not effect the  
15 assignees ability to communicate with individuals other  
16 than the assignor.

17

18 The status checking step 32 verifies the status assigned  
19 to the user by the individuals corresponding to the  
20 selected records. If any of the individuals have  
21 assigned a disallowed sender status to the user, an  
22 avatar will not be rendered responsive to their  
23 attributes, and thus will not be presented to the user  
24 for selection in subsequent steps. The user and the  
25 individuals, and their statuses, could be identified from  
26 the database, as shown by the dotted lines. Identity and  
27 status information may be accessed from a database (not  
28 shown) other than the database 16.

29

30 It should be noted that the identification of the user  
31 and the individuals, and their statuses could be carried  
32 out after the matching and retrieval process, or the  
33 matching process itself could ensure that the

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1 identification and status requirements are met before  
2 retrieval of the records.

3

4 The user then makes a selection 38 of the rendered  
5 avatars by clicking on the rendered avatar or an  
6 associated graphical display. The user enters a message  
7 which is forwarded to the individual who corresponds to  
8 the identifier of the selected avatar. The identity  
9 address of the individual may be obtained from the  
10 database 16, or another database (not shown), as depicted  
11 by the arrows 42.

12

13 As an alternative to the arrows 42 accessing identifier  
14 information from the database, all relevant identifiers,  
15 including status information can be retrieved during the  
16 retrieval 28 of the records. The identifiers can be  
17 stored 44, for example, as a link or embedded identifiers  
18 associated with the record or the rendered avatar.

19

20 The above-described method allows anonymous messaging  
21 between users, whilst allowing a user to select a  
22 recipient from a number of possible recipients based on a  
23 visual impression obtained from the graphically created  
24 avatars and other selection criteria.

25

26 The above description relates to a messaging method,  
27 although it will be appreciated that steps of the method  
28 could be used simply as a convenient method of selecting  
29 one or more individuals by:  
30 maintaining a database 16 of attributes and identifiers  
31 of individuals;  
32 retrieving 28 records from the database using input  
33 attributes;

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19

1 rendering 34 and displaying 36 an avatar using attributes  
2 stored in the selected records; and  
3 selecting 38 a rendered avatar.

4

5 It will also be apparent that although the above  
6 described messaging method renders avatars at two  
7 distinct steps (the input stage and the user selection  
8 stage), there may embodiments in which avatars are  
9 rendered at only one of the steps.

10

11 For example, a user may have pre-input a series of  
12 desired attributes, for which an avatar was rendered and  
13 stored. At a later time, for example when the user is  
14 present in a geographical location such as a bar or club,  
15 the user inputs the name of that location. The system  
16 conducts a search based on the pre-input attributes and  
17 the updated location, to provide a selection of avatars  
18 to the user that correspond to individuals that have  
19 indicated that they are present at that location. The  
20 user has thus obtained a short list of possible  
21 recipients that are in his immediate vicinity.

22

23 Alternatively, the messaging method may only render an  
24 avatar at the step of capturing the attributes, with the  
25 subsequent selection of the recipient being automated 46  
26 by the system based on the input attributes and stored  
27 records.

28

29 An alternative use of the system is in providing an  
30 individual with a list of users whose desired attributes  
31 match his own personal avatar. In this example,  
32 previously stored attributes desired by an individual are  
33 used to carry out the matching and retrieval process

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1 described above. One or more individuals corresponding  
2 to records retrieved by the search are notified that they  
3 have been located, and an avatar corresponding to the  
4 user carrying out the search is displayed. The  
5 individual is then able to communicate with the user.

6

7 With reference to Figure 4, an example system for  
8 capturing attributes of individuals, selecting  
9 individuals, and messaging is shown.

10

11 The system includes a database 50 of records, including  
12 attributes and identifiers of individuals implemented in  
13 Microsoft® SQL Server. A registration module 52 with its  
14 input 54 and display 56 is also provided. The  
15 registration module 52 also includes a module 58 for  
16 determining the identifier of the individual, and a  
17 module 60 implemented in asp.net for storing the  
18 identifier in the database 50.

19

20 The system further comprises a character engine 62 for  
21 inputting attributes, implemented using Macromedia® Flash  
22 with an input 64 and a display 66. The character engine  
23 also includes a selection module 68 for inputting or  
24 selecting attributes of an individual, and a rendering  
25 module 70 for rendering an avatar, in response to the  
26 input/selected attributes.

27

28 The character engine has a database access module 72 that  
29 stores the input attributes in the database 50.

30

31 The character engine 62 may be used to input attributes  
32 for selecting data from the storage means.

33

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21

1 The system for messaging accesses the storage means 50  
2 for storing the attributes and identifiers of  
3 individuals. The system includes an avatar rendering and  
4 selection engine 74 with an input 76, a display 78, and a  
5 module 80 for rendering an avatar using attributes stored  
6 in the storage means. The system also includes a module  
7 82 for selecting a rendered avatar, and a database access  
8 module 84. The avatar rendering and selection engine 74  
9 also includes identifier retrieval and status checking  
10 modules 77, 79 respectively, for determining whether or  
11 not a user has been specified as a blocked sender by the  
12 identified individuals.

13

14 The system includes a messaging engine 86 with an  
15 optional module 88 for identifying a recipient, allowed  
16 sender, or disallowed sender corresponding to the  
17 selected rendered avatar, and a module 92 for sending to,  
18 forwarding from, or blocking from the identified  
19 recipient or allowed sender or disallowed sender.

20

21 The messages are routed via a messaging network 94.

22

23 Figure 5 shows a possible implementation in which the  
24 methods and systems of the present invention could be  
25 incorporated.

26

27 With reference to Figure 5, the Web services link 410  
28 allows third-party services 412 to access and retrieve  
29 locally created avatars and/or attributes from the  
30 database 414 which are created and maintained by systems  
31 413 and methods in accordance with the present invention  
32 by users at terminals 415. The third party can access  
33 and retrieve based on a unique identifier such as e-mail

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22

1 address or phone number. This allows the third party to  
2 incorporate the personalised avatar and/or attributes  
3 into their service or database 416 for the benefit of  
4 their users on terminals 417. For example, this service  
5 could be a messaging service such as Hotmail®, MSN  
6 Instant Messenger®, or an ISP wishing to personalise  
7 their pages.

8

9 Via a Web Service is just one possible method of  
10 providing the avatars. The avatars may also be provided  
11 through agreement & database sharing, for example through  
12 a telecom interface 418.

13

14 Although the embodiments of the invention described with  
15 reference to the drawings comprise computer apparatus and  
16 processes performed in computer apparatus, the invention  
17 also extends to computer programs, particularly computer  
18 programs on or in a carrier, adapted for putting the  
19 invention into practice.

20

21 The program may be in the form of source code, object  
22 code, a code of intermediate source and object code such  
23 as a code in partially compiled form suitable for use in  
24 the implementation of the processes according to the  
25 invention.

26

27 The carrier may be any entity or device capable of  
28 carrying the program. For example, the carrier may  
29 comprise a storage medium such as ROM, for example a CD-  
30 ROM or a semiconductor ROM, or a magnetic recording  
31 medium, for example, a floppy disc or hard disc.

32 Furthermore, the carrier may be a transmissible carrier  
33 such as an electrical or optical signal which may be

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1   conveyed via electrical or optical cable or by radio or  
2   other means.

3

4   When the program is embodied in a signal which may be  
5   conveyed directly by a cable or other device or means,  
6   the carrier may be constituted by such cable or other  
7   device or means.

8

9   Alternatively, the carrier may be an integrated circuit  
10   in which the program is embedded, the integrated circuit  
11   being adapted for performing, or for use in the  
12   performance of, the relevant processes.

13

14   Further modifications and improvements may be added  
15   without departing from the scope of the invention herein  
16   described.

17